# DSC

## Digital Security Controls Inc.

# A Feasibility Study & Requirements Analysis

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# Introduction

Digital Security Controls Ltd. (DSC) is a Canadian company that is dedicated to the full spectrum of commercial and residential security needs. This dedication is expressed through the establishment of worldwide leadership in technology, manufacturing, and distribution.

A distribution network is managed by the subsidiary company DSC International Ltd. It has three main branches: DSC North America, DSC Europe and DSC Asia. DSC North America is marketing products dedicated to Canada, U.S.A. and Mexico; DSC Europe is working with all European companies, countries of Commonwealth of Independent States and China; DSC Asia specialises in whole Asian region and Africa. These offices are not interconnected and operate as separate entities, each with its own financial, managerial and support departments, controlled from the Canadian headquarter.

In this paper we will try to analyze the current course of operations of DSC Europe, whose managers have a strong belief that a large number of customers are lost to the competitors due to irrational ordering and shipment schemes that now in place.

# Company Background

In less than ten years, DSC Security Products established market leadership in the U.S. and Europe by supporting small distributors with cost effective, competitive products. Approaching each market according to its unique opportunities, DSC Security Products now has more than twenty-five direct sales offices that span the US, Canada, and Mexico and more than seventy in Europe. Each office serves its own local market and rarely is competitor to another office.

DSC maintains an ongoing commitment to bringing new technologies to the marketplace. Every year, a large percentage of the gross revenue is reinvested into the company for research and development. Over 200 engineers and technologists contribute to ongoing R&D projects with one goal in mind: providing high quality, cost-effective, and innovative products.

DSC is proud to maintain a 100% commitment to the product manufacturing. With complete control over the production process - from initial concept to engineering, from design to manufacturing - the DSC Group provides the most innovative products in its field, and is able to ensure product reliability and cost effectiveness. With automated manufacturing - right here in North America - DSC achieves the level of quality, the quantity, and the cost effectiveness that customers have come to expect from products offered by the company.

# Direct Sales Office (DSO)

DSOs are spread evenly among European countries. In some cases, when a country is large, i.e. the Russian Federation, a several DSOs are distributed among various provinces. In most cases DSOs serve large commercial and government organizations themselves and sell equipment to other companies that install it in residential areas and small businesses. Sales to other companies are wholesale and range from a few dozens to hundreds of pieces of security devices. Large scale organizations, on the other hand, may require thousands of items with complicated computerized management systems. For example, a bank's headquarters often contain a few hundred rooms. Each room must be equipped with a smoke detector, glass

break detector, motion detector, etc. Thus, the total number of devices required to secure a single building is measured in thousands.
To get a contract to outfit such a building, DSOs have to compete with dealers of other equipment manufacturers because when clients have the option to choose between several companies that deliver the same product, they would naturally choose the company that offers the best sale conditions.
Since all the equipment is manufactured in Canada and has to be delivered to the country where DSOs operate, there is a competitive advantage on the side of the companies that deal with local or regional equipment manufacturers. Because of this fact DSC International seeks ways to help DSOs in the Europe function in a more competitive fashion.

## Current ordering and delivery system

Each DSO has its own warehouse where it keeps a stock of equipment that it believes will be required soon either for some project or usual sales. When a DSO competes in a tender to equip facilities of some company, it usually has to plan ahead and order the required equipment in advance so that if it wins the tender, the task can be accomplished in the fastest pace.

Ordering of equipment happens either by e-mail or an order form that is faxed to DSC Europe. DSC Europe has its main warehouse in Budapest, Hungary and it serves DSOs in that region. The storage capacity is rather limited and therefore when an order is received DSC Europe evaluates it and sends back a pro-form invoice in which it lists items and quantities that it has in the warehouse and that can be shipped during the next scheduled delivery. The rest of the equipment, which is unavailable at the time of the order, is back ordered by the Hungarian warehouse from Canada and then shipped to a DSO.

All the equipment belongs to DSC until it was sold to the customers by a DSO; as soon as the equipment is sold, the DSO that was responsible for the transaction makes a payment to DSC for the sold devices.

## Problems of the current ordering and delivery system

During his interview, Mr. Alexei Tikhonoff, general manger, Paladin Security System, Moscow, Russia, helped us to find the most important points of failure of current ordering system. They are outlined below:

- Most of the orders that are placed by DSOs can be fulfilled by DSC Europe warehouse only to 50-60%. This equipment is usually shipped within the next 2 weeks to the DSO. The remaining 40-50% is delayed until the equipment is produced and shipped to Europe. Knowledge of such immediate shortage of the equipment makes DSOs keep a larger stock of products even though they are not required for the foreseeable future: therefore both companies (DSC and the corresponding DSO) are in disadvantage. DSC has their equipment and money spent on a product that is virtually frozen in the warehouses of the DSO, and DSO's warehouse is not used efficiently since it is paying high fixed cost for the space which is occupied by the mentioned above reserve.
- The time required to for the rest of the order to be delivered amounts to at least 2.5 – 3 months, and in some cases even more. Because of such a delay in the delivery of the products, some projects for which the DSO competes may be considered as infeasible and company has to withdraw its offer. Hence, both DSC and DSOs do not get all possible revenue.
- In case a tender is lost to competitors and all the required equipment has already arrived, a DSO is left with a surplus in its warehouse and company cannot unload it until either another tender is won or it is sold to wholesale buyers. In both cases DSOs are left with full warehouses for a long time that often can be on the scale of one year or even more and are not able to keep stock of the other

equipment that usually sells faster. As in the first problem, DSC has their money frozen in illiquid products.

- If a DSO decides to wait until the tender is won, it may not usually meet the timeframe that was allocated for the installation of the security system. In such cases, clients may change their decision to use the services of the DSC DSO and use equipment of the competitors. Hence, as described above both DSC and DSO are in disadvantage.

The more detailed description is given in P.I.E.C.E.S.:

**P*erformance*** – *Does the current mode of operation provide adequate throughput and response time?*

No, as identified above, the delays happen whenever a DSO places a new order of equipment. The delays in delivery are substantial and cause a slowdown of the overall sale process of already produced devices and customer service. Such delays dramatically reduce satisfaction of the end users, who require installation of the equipment to be performed in the timely fashion. Degraded performance of the DCS dealers may lower respect for the brand and decrease sales further.

**I*nformation*** – *Does current mode provide end users and managers with timely, pertinent, accurate and usefully formatted information?*

No, currently neither of the parties gets proper information. DSOs are not aware of the status of their orders and it takes two levels of personnel to be able to find out; first DSC Europe is contacted via e-mail or fax and then it in place contacts DSC International. DSC Europe does not know the exact quantities of equipment that was already sold, reserved or unused by DSO at any time and in order to check this, a request to the company is issued and then it response is received after a short delay. Keeping in mind that there are more than seventy DSOs in Europe, such task takes a lot of human resources and statistics are not always up to date. Without this information, the factory in Canada does not know what kind of equipment to start producing in advance and production loss is present whenever factory needs to make changes in the production quantities.

**E*conomy*** – *Does current mode of operation provide cost-effective information services to the business?*

No, a considerable amount of man hours is required to collect and keep all the information. But the losses that DSC Europe suffers from delays in delivery of equipment and inadequate statistical information gathering are measured on the scale of millions of dollars per year.

**C*ontrol*** – *Does current mode of operation offer effective controls to protect against fraud and to guarantee accuracy and security of data and information?*

No, information is inaccurate: exact numbers for all DSOs are always unavailable. Current way of collecting information theoretically allows competitors to intercept orders by DSOs and responses by DSC Europe, since e-mail infrastructure is not secure and mail server can be controlled by hackers. Currently no encryption methods are used to prevent others to read such e-mails. Errors in collection of information may happen such as mistyping or loosing transferred e-mails at all. All collected information currently entered into a database manually.

**E*fficiency*** – *Does current mode of operation make maximum use of available resources, including people, time, flow of forms, etc?*

No, it takes a lot of time to collect and enter information. Sometimes if e-mails are lost, an additional request is required. Because of a high probability of errors, additional time is required to double check entered information. Clearly even with use of computers now the process is not optimised and human data processing is error prone. On the business side, inefficiency comes from surplus that is

generated by customers that drop orders because of delivery delays as described above and loss of potential customers that is generated by the inability to deliver the products at either the time frame or cost that is provided by the competition.

***Services*** *– Does current mode of operation provide reliable service?*

No, service is not reliable. For DSC it not reliable in terms of required equipment it has to produce and ship in advance. For DSOs service is not reliable since all the time their order can not be shipped immediately.

# Objectives

The sums that are lost due to inability to deliver the product on time and surplus that is generated by reserves that are unused and orders that were cancelled are roughly estimated to almost 20% of the total sales by DSO. Therefore the objectives that have the highest priority are:

1. Elimination of surplus that is caused by an inefficient distribution of reserves for anticipated projects among the warehouses.
2. Producing a reform to eliminate or significantly reduce the delay in a delivery of a product. That would eliminate the surplus and the loss of potential customers that are caused by customers abandoning projects because of company's inability to deliver the products on time
3. Elimination of errors in the communication between branches.
4. Minimization of internal costs within the organization structure like the salary of clerks who are responsible for company intercommunication and generation of reports.

With these goals in mind system must new system must be secure, reliable and user friendly. There should be ways to backup information automatically on regular basis. A team of specialist should be available to resolve any inquired problems.

# The Scope of the Problem

The current stage of efficiency and profitability improvement, will not attempt make improvements in the production process in Canada. All changes that are now in place should be concentrated on the European region only and deal only with DSC Europe operations. From now on, whenever the term DSC is mentioned, it would only relate to the European part of the company.
Our primary goals will be to optimise the current system of ordering of the equipment for a DSO, elimination of the surplus of the equipment that is stored in DSOs' warehouses, and shortening the delay in delivery of the product to the consumers.

# Economic feasibility study

## *Plan of attack*

In order to eliminate the problem of inefficiency that was proven to be present in the current course of operations in the company, we suggest a range of possible alternative systems that deal with the mentioned above problem. Our choice of approaching the problem is first to evaluate possible business solutions. Each business solution must correlate with the overall business goal of the corporation and be restrained within the scope of the problem. Within each business solution we proceed to produce and evaluate the technical and operational possibilities that fall within the spectrum of costs/benefits of that solution. We shall reference those as technical solutions and their aim would be to enable the implementation of the business solutions.

## *Business solutions*

### 1. Unite all entities in regard to sales/stock data through a central catalogue.

To eliminate the surplus that was discussed at the problem identification phase we suggest linking the storage and sales departments of all the entities in the cartel, namely of DSC's and all of the DSO's. All data regarding sales and stock would be stored in a central catalogue, which would be located at the main office of the DSC and would be hastily available to all other entities. This course of amalgamation would allow communication between all sales/storage departments of all the different entities which would in turn enable dealership sales departments to recall surplus products from any other dealership department's storage facility instead of placing an order to manufacture new products at the factory. The benefits for the company's customers could possibly consist of a quicker delivery time in case that the product already exists in stock in one of the storage facilities of either the DSOs or DCS. It would then be shipped from that storage facility to the DSO that requested it instead of being manufacturing at the factory. The benefits for the company would include the elimination of surplus and more satisfied customers that would prefer this company to the competition because of faster delivery time.

### 2. Sell surplus at lower cost

Another possibility to eliminate surplus is to sell it at a lower cost. The cost would be determined according to various factors such as the condition of the market and the length of the time period during which the surplus has been lying in storage. DCS's main office will dictate to the DSOs that have the surplus what would be the new price. The price will drop each month by 5%, starting from the initial 100% (see restrictions, page 7). The current revenue loss of DCS due to an inefficient surplus management is approximated at 20% of the total income of the company. If solution 2 is implemented, and all surplus products would gradually drop in price until they are sold. According to the calculations provided in the appendix, page 16 a unit of surplus would be, on average, sold after 1.08 years at the price of 35 per cent of the original price, thus reducing the revenue loss of the company to 13% from the original 20%. The benefit to the customers would be a lower price for the product. The benefit to the company would be elimination of surplus.

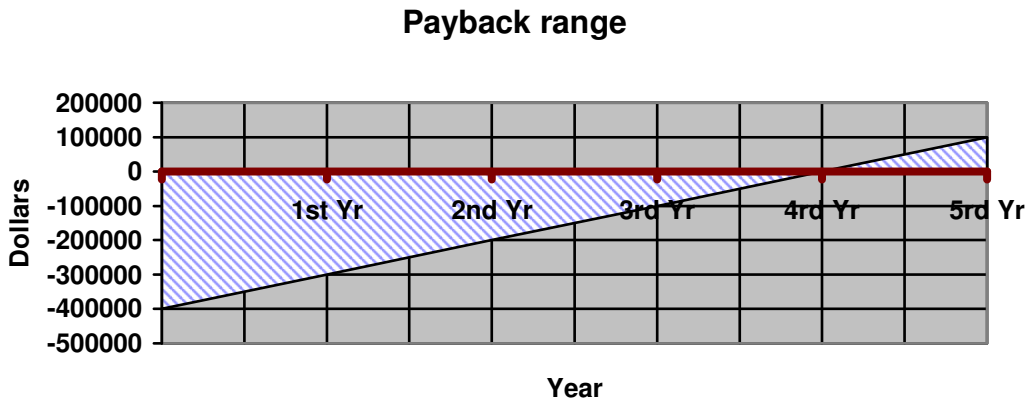
### 3. Maintain current system of operations

Another option would be to continue operating according to current procedures

# Restrictions imposed by the management on possible solutions

**Solution 1: Unite all entities in regard to sales/stock data through a central catalogue.**

During the interview, the manager has indicated that the deadline for the new system to produce profit is 4 years from the beginning of the implementation and the amount of the initial investment must not exceed 400,000$. Therefore the management will support a new system only if we restrict the immediate development cost and the long run operational costs versus the expected profit to fit into such range.




**Solution 2: Sell surplus at lower cost**

The rule according to which the price of a product will be determined is as follows: Starting from the initial 100%, drop the price each month by 5% until a buyer is found.

**Solution 3: Maintain current system of operations**

No changes required therefore no additional restrictions apply.

# Technical feasibility study for business alternatives

Within each business solution we proceed to produce and evaluate the technical and operational possibilities that fall within the spectrum of costs/benefits of that solution.
Since only business solution number 1 relies on a computerized system we shall only propose and analyze technical solutions for it rather than for all three.

## *Criteria for alternative technical solutions*

- **Costs:** Two separate costs should be taken into consideration in order to choose the best technical solution for the proposed business alternative: Developmental costs and Operational costs. Development costs include new hardware such as servers, personal and computers, new software and new data communication paths such as new or upgraded cables or using another company's recourses. Operational costs include salaries for new employees to operate the system and various yearly costs to maintain the new system.

- **Ease of Use:** The proposed system has to be used on a daily basis by the employees therefore it has to be easy to use and understand in order to avoid errors and reduce operating time.

- **Expandability:** The new system must be able to provide a platform that easily supports company's growth and can be upgraded quickly and cost effectively to accommodate future endeavors by the company.

- **Security:** The system must be secure, since confidential data might be transferred through the system's communicational channels.

- **Compatibility with Current System:** Any proposed solution must be capable of being integrated with current system and allow the transition to be done as quickly and smoothly as possible.

- **Operational Functionality:** The system has to perform better then the current system in all respects. Data retrieval, communication between the head office and remote locations and between the remote locations themselves has to be more efficient. It should support the functional needs of all the entities in the system.

- **Scheduling Feasibility:** The change to the new proposed system must be done within reasonable time to fit into the time frame that the management imposed (see restrictions, page 7).

## *Technical solutions*

Using the above described criteria and the detailed information we have gathered about the company, page 21, we will now propose solutions to enable intercommunication between the entities as suggested in the first business solution.

### Alternative # 1

In order to enable communication between the DSOs we propose to have a main database in the main office (Budapest) that will contain information on the inventories of all the DSOs in that region. Whenever a DSO receives an order from a customer, a clerk will send an e-mail to the main office requesting the products. The main office then replies if the order can be fulfilled. If so, the main office initializes shipment of the necessary parts from the main storage facility and other DSOs in close proximity if the storage facility does not have enough of the required product. If neither the storage facility nor the near by DSOs have enough of the product, the head office sends an email to the Canadian factory to produce and ship it. This alternative solves the problem of lengthy delivery times and enables the DSOs to get rid of their surplus (explained in problems of current system).

### Alternative # 2

The second alternative expands on the first. It provides a faster, virtually instantaneous way for DSOs to communicate with the head office. The current information system will be revamped to the Internet connected real time system. The database in the main office will act as a server and all the information that is described in alternative 1 will be available on line to the DSOs through a DSO Client Program. This system will greatly improve the information system of the company because the relevant information will be instantaneously available through secure and private extranet. For example, whenever a DSO is ready to order new equipment, the manager connects to the main office database and submits a request for the needed amount of units. An automatic applet then calculates the best configuration of shipments from other DSOs / shipment from main storage facility / production at the factory and automatically sends requests to the appropriate facilities to ship / produce the units for the DSO. All the information regarding this transaction will be updated in the database and the stocks of the various storage facilities will be recalculated.

### Alternative # 3

To extend alternative 2, we propose to link each DSO with the head office and every other DSO using dedicated information flow lines. This will allow direct communication between the DSOs without the

involvement of the head office. Since there is always a connection, all the transactions and all of the inventories are updated instantly. However the main advantage of this principle over the principle of one main server as in alternative 2, is the reliability of the system; If the main server is either unreachable or goes off line for some reason, the DSOs can still contact other DSOs to check whether any of them have the required products in reserve.

## *Benefit analysis*

Detailed costs analysis can be found in the Appendix C of this report.

### Alternative #1

| TYPE | BENEFITS |
|---|---|
| ***Monetary*** | ✓ Total Developmental Costs: $23,000.00<br>✓ Total Operational Costs: $30,000.00<br>✓ Rank 1st |
| ***Operational*** | ✓ Reduces a problem with not being able to fulfill a customer's order in the allotted time.<br>✓ Eliminates man hours spent on performing manual cataloguing of information and generation of reports |

### Alternative #2

| TYPE | BENEFITS |
|---|---|
| ***Monetary*** | ✓ Total Developmental Costs: $96,000.00<br>✓ Total Operational Costs: $2,055.00<br>✓ Rank: 2nd |
| ***Operational*** | ✓ Server upgrade reduces processing time in the head office.<br>✓ Great reduction in time necessary to get a response to an order.<br>✓ Great reduction in human error possibility due to automated ordering system<br>✓ Increased security of data transfer.<br>✓ Eliminates man hours spent on performing manual cataloguing of information and generation of reports as well as on manual communication between DSOs and head office (email) |

### Alternative #3

| TYPE | BENEFITS |
|---|---|
| ***Monetary*** | ✓ Total Developmental Costs: $126,000.00<br>✓ Total Operational Costs: $3,000.00<br>✓ Rank: 3rd |
| ***Operational*** | ✓ Server upgrade reduces processing time in the head office.<br>✓ Great reduction in time necessary to get a response to an order. |

| | |
|---|---|
| | ✓ Great reduction in human error possibility due to automated ordering system<br>✓ Increased security of data transfer.<br>✓ Eliminates man hours spent on performing manual cataloguing of information and generation of reports as well as on manual communication between DSOs and head office (email)<br>✓ Enables communication between DSOs in case of failure of main server |

## Feasibility matrix

This feasibility matrix provides quantitative measures of each alternative in each area of the criteria set out for the design of the new system. We're rating each alternative out of 5 for each criterion, with 5 being the highest score and 0 being the lowest.

| CRITERIA | ALT#1 | ALT#2 | ALT#3 |
|---|---|---|---|
| **Cost** | 4 | 2 | 1 |
| **Ease of Use** | 3 | 5 | 2 |
| **Expandability** | 2 | 5 | 2 |
| **Security** | 1 | 3 | 3 |
| **Compatibility With Current System** | 4 | 3 | 2 |
| **Operational Functionality** | 2 | 4 | 5 |
| **Scheduling Feasibility** | 4 | 3 | 2 |
| **TOTAL:** | **20** | **25** | **17** |

# *Summary of alternatives*

## Alternative # 1

The first alternative provides the basic solution for the presented problem. It accomplishes the task set out by the problem definition. It is cheap and easy to integrate into the current system. The only thing that has to be changes is to upgrade the database software to evaluate the inventories of the DSOs and being able to create new orders. While its simplicity is appealing, its efficiency is anything but. Each DSO has to send its requests to the main office to be evaluated and replied to by e-mail. The waiting time could be important and unacceptable.

## Alternative # 2

The second solution improves on the first and fixes a lot of its shortcomings. The web based system is fast and efficient. As well it gives the DSOs the opportunity to see what's available right away and where it is. The response time is much faster then the first solution. However it comes with a steeper price. Hardware and software have to be significantly upgraded and maintained. The server needs to be connected to a high speed line and so do the DSO. The system could be further expanded for further future changes easily and fairly quickly. It is relatively easy to use and

can be set up fairly quickly. The developmental cost is somewhat high, but with increased efficiency it will pay for it self fast enough.

### Alternative # 3

This alternative is the biggest and hardest to undertake, but potentially but is the most reliable of all other alternatives. It provides increased security to everyone involved through a secure network. The development and operational costs are the highest and it is fairly difficult to use. Its functionality and efficiency are its greatest pros.

## *Best alternative*

It seems that alternative number 2 scored the highest mark among the three possible solutions. It does fit into the cost/benefit range that was imposed by the management since the implementation cost is $96,000 and the gain is total elimination of reserves and surplus the delay in supply of orders which amounts to 20% of company's losses and hence by far outnumbers the development and implementation costs. Therefore we shall use this technical solution for the business solution of establishing communication between the DSOs and DSC's main office in Europe.

# Analysis of business solutions relying on their technical implementation

## *Feasibility analysis matrix*

| Feasibility Criteria | Weight | Solution 1 | Solution 2 | Solution 3 |
|---|---|---|---|---|
| **Operational** | **40%** | ○ Reduces the problem of not being able to fulfill a customer's order in the allotted time.<br>○ Reduces or eliminates surplus.<br><br>Score: 100 | ○ Reduces or eliminates surplus<br><br>Score: 50 | ○ No changes to current scheme<br><br>Score: 0 |
| **Technical** | **10%** | ○ All necessary hardware components are found in the market. A new software system needs to be created.<br><br>Score: 20 | ○ No changes to current scheme<br><br>Score: 100 | ○ No changes to current scheme<br><br>Score: 100 |
| **Schedule** | **10%** | ○ This option would require the most time to implement since it involves development of new software and reorganization of current system | ○ reorganization of current system | ○ No changes to current scheme |

| | | | | |
|---|---|---|---|---|
| | | Score: 0 | Score: 30 | Score: 100 |
| **Economic** | **40%** | ○ Expensive to implement.<br>○ Cheap to maintain since no clerks are needed for automated system.<br>○ Eliminates all company's losses (20% of income) that are caused because of long delivery time and unused reserves/surplus<br>Score: 70/100 | ○ Eliminates 35% of company's yearly losses because of unused surplus starting from 1.08 years after beginning of implementation<br>○ Expensive to maintain because of high clerks salaries<br>Score: 35 | ○ No changes to current scheme<br>○ Expensive to maintain because of high clerks salaries<br>Score: 0 |
| **Rank** | **100%** | **70%** | **47%** | **20%** |

### *Best solution:*

From the evaluation above, the best solution is alternative number 1: Unite all entities in regard to sales/stock data through a central database that is located at DCS's HQ. The economic profits that follow the reduction of surplus and fast delivery time are by far superior to selling the surplus at lower cost or maintaining the current course of operations.

## Conclusions

Let us recall the tasks that we were about to deal with in this feasibility study:

1. Elimination of surplus that is caused by an inefficient distribution of reserves for anticipated projects among the warehouses.
2. Producing a reform to eliminate or significantly reduce the delay in a delivery of a product. That would eliminate the surplus and the loss of potential customers that are caused by customers abandoning projects because of company's inability to deliver the products on time
3. Elimination of errors in the communication between branches.
4. Minimization of internal costs within the organization structure like the salary of clerks who are responsible for company intercommunication and generation of reports.

Now let us shortly demonstrate how our solution deals with each of those tasks:

1. Through the implementation of main server that would be located at the DCS office in Europe we will enable each of the DSCs to connect to it using a web page and place orders for merchandise. The server automatically locates any nearby DSCs that have the required products in stock (either because of surplus or reserves) and initiates shipment of those products to the DSC that placed the order. This way there is an almost complete elimination of surplus and reserves that we were set to fight against.

2. Since the process of placing orders is computerized and fully automates, placing the order by a DSC clerk takes virtually no time and the time that it takes to the server software to calculate the most advantageous combination of shipping different quantities of the product from different DSCs takes even less time. Moreover, a greater reduction of time arrives from the fact that now there is a possibility for any DSO to actually use the reserves and surplus of any other nearby DSO so orders are processed much faster since there is no need to produce the items at the factory and ship them to Europe.
3. The computerized system fully eliminates all human errors in the communication between the entities of the system since most calculations and arrangements of orders are done automatically by the server software. Therefore the only required human input is merely placing the orders that were submitted by the customers by a DSO clerk.
4. The elimination of the huge network of paperwork that is currently in place would also eliminate the need to keep the vast amount of clerks that are responsible for maintaining it.

All in all, the suggested system is expected to perform according to all requirements and restrictions posted by the management and therefore we highly encourage its implementation.

# Requirements Analysis

The proposed solution is complex system, which will require integrating different hardware/software platforms into a single workable unit. The system requirements were designed to fit the needs of the company and were discussed and approved by Mr. Andrei Petrov.

## *Functional Requirements*

In order for the new information system to be integrated seamlessly into the existing one without the need to retrain most of the current stuff, the following scheme was designed. Each person will have different levels of access to the information depending on his status of in the company.

A. **Sales Personnel –** the sales personnel will use the existing procedures that were adopted by each DSO. In most cases, a sales person will have access to the local database, where he can check the availability of the products that were requested by customers. If the required amount is not immediately available, an order request will be sent to the DSO sales manager. In each case the requests will use a form that is already in use in each particular DSO. Sales people will not have access to the new system.

B. **Sales Manager –** A manager of each DSO will collect the request forms from sales personnel and prepare an order. Each order must contain at least enough product requests for it to be economically efficient from the delivery cost perspective. Therefore, orders are to be placed on a weekly basis or in some cases two-week basis. The orders are submitted through an interface uniform for all DSOs; for security and portability reasons this interface will be written in Java and will be run on a computer located at the DSO. Each manager will be required to check the system (by running the program) every business day. During such checkups a manager will be able to see the status of his order; in case the order was combined into the proform by the server the manager can validate it. If the manager sees an order for equipment from another DSO, he will have to either approve or disapprove it. After that if equipment shipment request was received, the manger is required to organize shipment of the equipment to the DSO of destination. Each day a log of changes in the local database will be submitted through this program to the main database. The log files can be created by most database systems automatically; the system should be able to accept log files generated by different DBMS.

C. **DSO Europe Server –** is a main block in the new system. Most of the functionality will rely on it and all data flows will pass through it. The main functions of the server are:

   - Keep a database of the products located in the warehouses of each DSO. For all products every DSO has their own reserved quantity that the server has no control of. Changes to the holdings from the DSOs are merged on a daily basis. Log files should be accepted generated by different databases.

   - Accept orders from the DSOs and calculate the best, from economical standpoint, order fulfillment method. First priority is given to the main European warehouse. If there is not enough equipment to close the order, database is queried for the DSOs that are the nearest (cheapest to deliver) to the queried DSO. Then requests are sent for approval to the found sales offices. If they are accepted, the request for approval is send to the DSO of the destination for the final validation. In case when either no equipment was found in the warehouses of the nearby DSOs and in the main warehouse or if any of the requests to these DSOs were not validated, the system should issue a request for manufacturing for the

Canadian office. As soon as manufactured products have reached the main European warehouse, appropriate notifications about the order completion are dispatched.

- Check inventory of any DSO that is financially appropriate for delivery of the equipment to the DSO that requested the equipment.
- Keep information and have the ability to evaluate the cost of the shipment of the equipment from one DSO to another.
- Request approval from source DSO for shipment to DSO of destination.
- Generate best alternative for delivery based on the cost information.
- Request an order validation from the DSO of destination.
- Request shipment of the equipment to the DSO of destination from appropriate warehouses.
- Generate statistics on equipment requests by each available parameter.
- Create logs all activities (history option).
- Automatically backup all the information daily.

## *Non-Functional Requirements*

Below are the aspects of the system that are needed to support the functional part.

### Interface requirements

User Interface (UI) should be written in the Java programming language using Swing (to solve graphics speed issue Java SDK and VM version 1.4 should be used). Creating this type of an interface will enable running this program in a secure, platform independent way. The interface should be designed with intelligent placement of buttons and fields and otherwise should be defined as "user friendly". All parts of the interface should include pop-up balloons with description of the field. As minimum requirement this interface should require 800x600 screen resolution. Final touches are left to developers and some small changes are to be made during the testing of the system.

- End User UI – this UI should be tabbed. The first tab that is loaded first should contain information about current state of the placed orders in the table form, a separate table should contain request for shipment from other DSOs, new requests should be highlighted; below the tables a button should be placed clicking on which user will be able to submit latest change log file from the local database. Orders whose status requires validation should be clearly visible and by clicking them an additional window should be open that will present detailed list of how the order will be fulfilled. It should list items that are coming from different locations in different colors. Estimated shipment costs should be included for the user to make choice of whether to order from another DSO or request the order from the manufacturer (DSC Canada), each field should have estimated delivery time. For the case when the user will want to request manufacturing (not delivery from the other DSO), he should be able to select this option right in the report. After the report was modified, there should be a button to proceed with ordering. Before the order is sent a non-modifiable summary of the order should be shown with two buttons, either to make additional changes or send the order to the main office (DSC Europe). With the second tab user should be able to make initial order for the equipment. A user should be presented with a table where he can

choose (drop down list) an item from the catalog to order, then quantity required. A new field should appear when the previous one was successfully finished. After the order is complete, a user should be presented with non modifiable summary of the order (list of items and quantities) with two buttons, either to return and make additional changes or send the order for evaluation to the DSO. The third tab should provide a list of messages from the DSC Europe and way for the user to write a new one and reply to the existing messages. And the last tab should allow user to access history of previous orders with detailed information on the time it took for the order to be delivered each order.

- DSC Europe UI – this interface should include searchable information about all transactions between DSOs and DSOs and main warehouse. Requests for manufacturing from the DSO should be combined into a single order to the DSC Canada and then exported into the format accepted by the current system. Advanced statistics on whole line of products, all DSOs, seasonal data, times for the equipment in each stage of the delivery process, etc. Interface should provide a way to check status of the DSO warehouses.

- Tech support UI – this UI should provide easy access to the transaction logs and errors generated by the system.

## Performance requirements

The system does not require a high workload; therefore we don't need the most expensive equipment performance wise. Though, at some point workload may grow (as functionality of future project will be added), it will never reach proportions of highly visited web server.

- ***Time Bounds –*** all transactions with the server should be "instant". This means that each transaction should take a maximum of 4-5 seconds to complete even with slow modem connection.
- ***Space Bounds*** – the system is expected to hold information on stocks of all DSOs in the area, what's more all logs are also to be stored for the whole time server work for many years in advance. Therefore, it is possible to estimate that database may be the size on the scale of 500 MB – 1 GB after several years of operation.
- ***Security*** – the client programs should be password protected and passwords are to be verified with that on the server. All transactions between the system server and client programs much be encrypted with at least 128bit key algorithm, however more secure transactions are preferable. Client program should not be allowed to connect to the server during the range of the business hours for each particular DSO. Server should block (be in stealth mode) any client transactions during non business hours for all DSOs.
- S***urvivability*** – server should be equipped with a RAID-5 HDD system for mirroring and hot swapping possibility. In addition, all data must be backed up on a daily basis to a server located in a different location, preferably different county. The backup file must be encrypted with the most secure algorithm available. In case of failure system should inform support team about the problem.

## Operating requirements

Although we are not building high availability system, we do not want the system to be unavailable for transactions for more than one day in a quarter. All maintenance should be performed only during the off business hours.

- ***Personnel availability*** – the system should perform without constant control of humans. But in case of system failure a support team should be available withing 12 hours of the time the problem occurred, and then problem should be fixed within another 12 hours.

- ***Physical Constraints –*** the system should consists of 2 1U chassis blocks, one is the actual server the other one the storage array.
- ***Personnel skill constraints*** – the skill requirements from the end user should be minimal, generally knowledge of basic operation of Windows OS have to be sufficient for using the client program.

## Lifecycle requirements

A. ***Quality of Design***

- Portability – the system should be written in OOP Java 2. This will allow for it to exist in the new environments once such changes will be required.
- Maintainability – the server should be easily reachable by the support team. If problem can't be solved for the current state, the roll over to the previous best state should happen. In such case a message to all users should be sent to inform of such malfunction and ask to resend the data that was submitted after the last backup.
- Expandability – the system should be designed so that additional blocks can be included into the system at a later date. All source code should be well structured and if required one part of the program should be replaced with the new one without requiring rebuilding the whole system.

B. ***Limits on Development***

System should be available for initial testing for at least 4 months. All offices should be provided with extensive manuals on the operation of the program. In the next 4 to 6 months a development team should be available for immediate repairs of the program. After that they should be available in the on demand mode. The system source code and blocks should be well documented for the reason of being able to change system later. All source code and documentation must be submitted to DSC Europe after the development stage has finished.

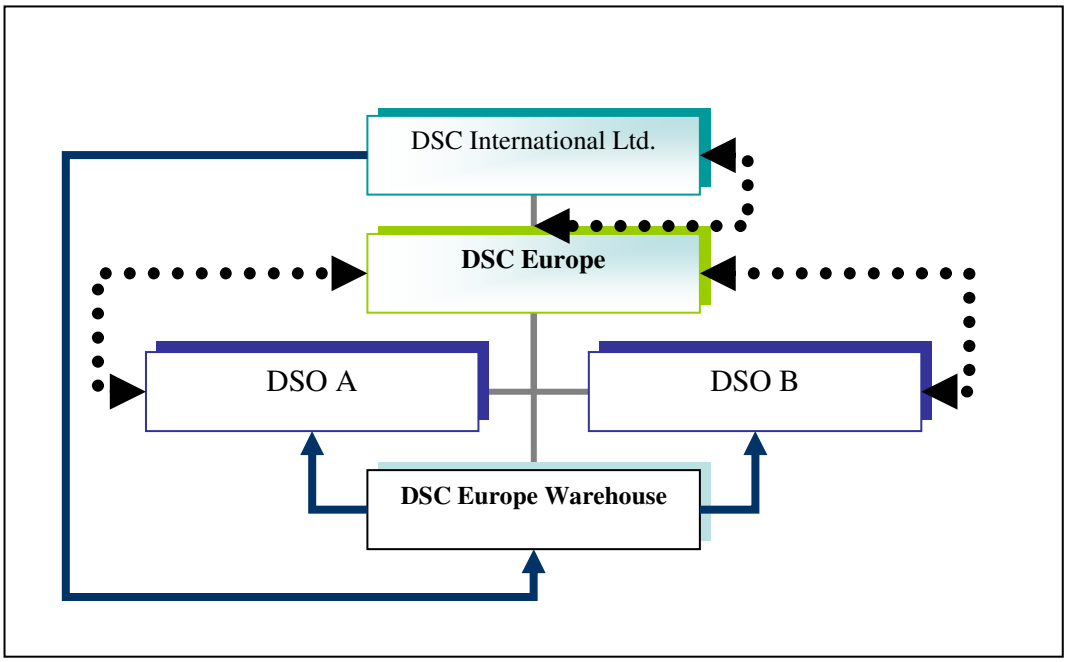
## Economic requirements

The economic requirements were listed on pages 8-9.

## Testability

The system should be thoroughly tested, including cases when the system is accessed by DSOs at the same time. Client program must communicate with the server so that they know all system message and can be recover from any data loss occurred during the transactions. During the initial testing managers of the DSOs should be given a way to communicate their problems and suggestions to the developers.

# Appendix A – Present data/products flow scheme



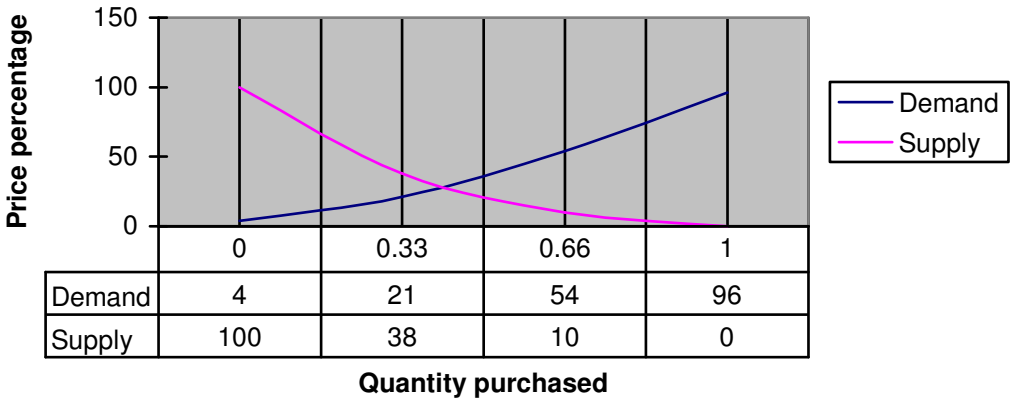

Information flows (e-mails, faxes, etc)

Product flows

# Appendix B - Market research for solution 2

In order to precisely define how the consumers would behave in a situation where DSC maintains a policy of lowering the price of the product we must carefully analyze the supply and demand diagram for a product that is in surplus. Such product's market price would be significantly lower than the initial price that such product would gain if it was ordered from the DSOs. Since the product is in surplus, it means it has no current demand; therefore its market price is lower. Based on statistical data, courtesy of DCS, we have some understanding how does the market behave on average in case of such product. The following diagram illustrates the relationship between the price of the product in surplus and the demand for it.

**Supply / Demand diagram for products in surplus**




| | 0 | 0.33 | 0.66 | 1 |
|---|---|---|---|---|
| Demand | 4 | 21 | 54 | 96 |
| Supply | 100 | 38 | 10 | 0 |

**Quantity purchased**

Evidently the equilibrium is reached at the price of 35 per cent of the original price.
That means that on average, most of the surplus products that were offered at successively lowering price, would be purchased at the price of 35% of the original. Considering that DCS lowers the price of the surplus products by 5% every month, on average, the surplus stock will be eliminated in 13 months or 1.08 years.
Since the initial losses of the company were 20% because of the inability to sell the surplus, now, when the surplus is sold at the price of 35% of the original, the losses of the company would cut down to 20*(100-35)/100 = 13%.

# Appendix C - Detailed cost analysis for technical alternatives

This is the detailed cost analysis for each alternative. It highlights the developmental and operational costs for each alternative as well as providing the final sum that it will take to accomplish that particular solution for the new information system.

**Alternative #1**

| TYPE | ITEM | COST | SOURCE | TOTAL |
|---|---|---|---|---|
| **Developmental** | - New database software that provides necessary functionality.<br>- New PC | $20,000<br>$3,000 | DSC Management<br>DELL PC | $23,000 |
| **Operational** | - Salary of person who handles orders from DSOs and check if direct sales from other DSOs are possible. | $33,000 | DSC Management | $30,000 |

**Alternative #2**

| TYPE | ITEM | COST | SOURCE | TOTAL |
|---|---|---|---|---|
| **Developmental** | - New server.<br>- Web server developer salary for developing the web system. | $15,000<br>$71,000 | DELL PC<br>www.datamasters.com | $96,000 |
| **Operational** | - Site management.<br>- High speed connection. | $1,000<br>$1,055 | Cable & Wireless business rate | $2.055 |

**Alternative #3**

| TYPE | ITEM | COST | SOURCE | TOTAL |
|---|---|---|---|---|
| **Developmental** | - High speed connections.<br>- New server.<br>- Software development that allows DSOs to make orders though the software from each other. As well as keeping track of the inventories for the DSOs and upgrades information in the database. | $1,055<br>$15,000<br>$110,000 | Cable & Wireless<br>DELL PC<br>www.databasesolutions .net | $126,055 |
| **Operational** | - Maintenance of system. | $3,000 | DSC Management | $3,000 |

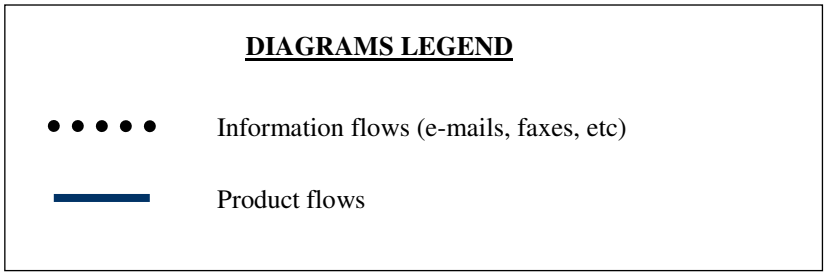
# Appendix D – Data/product flow schemes for technical solutions

- **Alternatives #1 and #2**

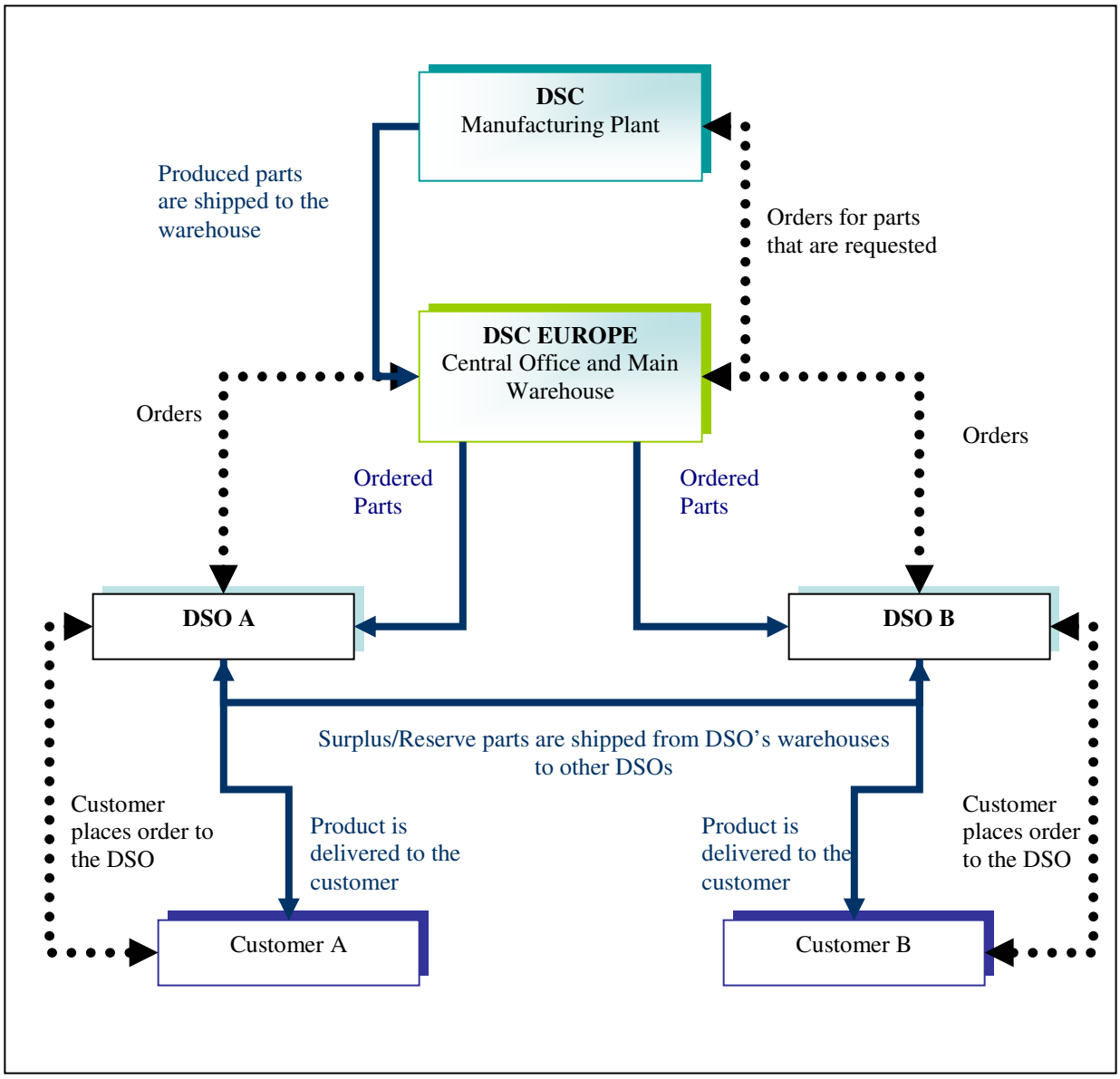
When a customer orders merchandise from a DSO, the DSO checks if it has the required amount of that product in its reserve or surplus and sells it directly to the customer. If not, the DSO forwards the request to DCS Europe. DCS Europe keeps a database of all available stock (surplus/reserves) in both its own storage facility and the storage facilities of other DSOs and if the required amount is found, it arranges for its shipment to the initial DSO. If required amount is not found, then an order for its production goes to DSC manufacturing plant in Canada and it is then shipped to DSC Europe and then to the initial DSO. For the first alternative DSOs use e-mail or fax to place this order to DCS Europe, and have to wait for a reply. Using the second alternative, they can place these orders directly through web-based software.

- **Alternative #3**

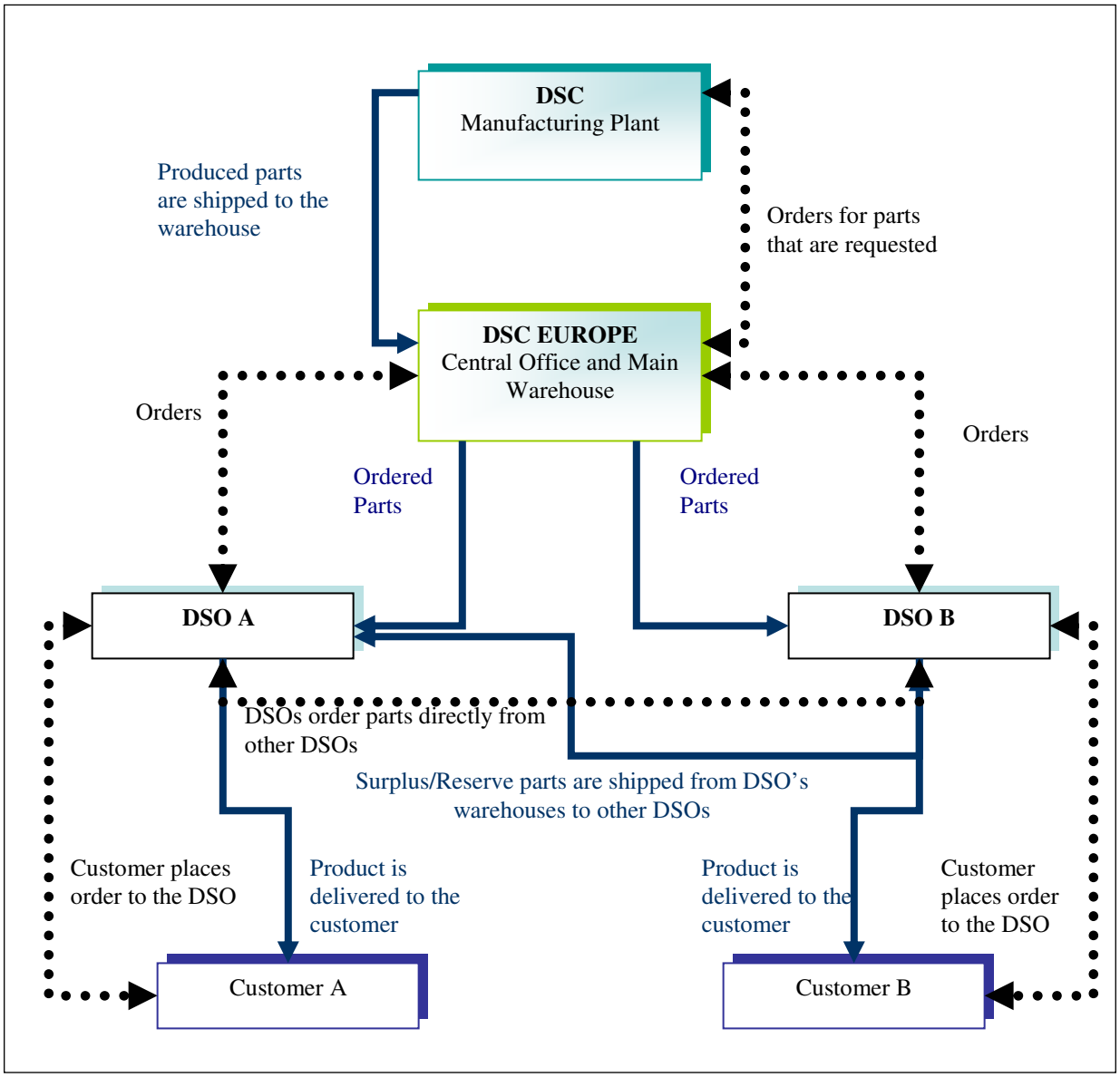
For the third alternative the same ordering procedures apply. However, in the case there is direct communication between the DSOs without the involvement of the head office and orders of surplus/reserves and their shipments can be made directly from one DSO to another.



**Alternatives #1 and #2**



**Alternative #3**



# Appendix E – Interview with DSO's general manger

**The following is the transcript of the interview conducted by Moutovkin Serguei (MS) with Alexei Tikhonoff, General Manager of Paladin Security Systems, DSO of DSC in Moscow, Russia (AT).**

MS: Please, describe to me the basic process of the ordering equipment from DSC and its delivery to your company.

AT: It is very simple; a request is sent using either e-mail or fax to Budapest, Hungary.

MS: Is there any special form that you adhere to?

AT: No, we just list the products that we need from them and quantities. Usually we send an order for 30 - 50 items with quantities varying each time so that everything fits into the 10-feet truck. Although equipment is expensive, it does not take a lot of space.

MS: How often do you place orders for the equipment and what is the total cost of the equipment in each shipment?

AT: The delivery happens approximately every 2 or 3 weeks. The cost of the equipment that fits into the truck is around USD $100'000. We are required to maintain at least a small quantity of every item DSC produces. Also sales on different products depend on the season, so in summer more outdoors devices are required, in winter more indoors. Therefore quantities vary seasonally and in response to the demand.

MS: Does it ever happen that you don't receive some of the products that you have ordered.

AT: Yes, it happens almost all the time. Sometimes up to half of the order can't be shipped immediately. So DSC Europe makes a back order for the items we need and then they are shipped later. Most often they don't have equipment that is rarely used. Out of 400 items in DSC catalogue half are needed only for specific projects or for some specific customer orders. It is usually these items that require back orders.

MS: How long should you wait for the back ordered products to be delivered.

AT: Sometimes two month, sometimes 3 month. Depends if some of the items are already produced in Canada and just waiting to be sent to Europe or if they should be manufactured first and then shipped to Hungary.

MS: If there is some large tender that you compete for with other companies; do you pre-order some parts first or wait until the tender is won?

AT: We wait until it is won. Then customers make some small payment and the order is made. The rule is that we don't order anything until we know at least that we have won.

MS: Do you know any case when the order was cancelled because it can't be shipped in time?

AT: Yes, it happened before. But since in most cases we order after the first payment has already been made, customers will wait for all equipment to be shipped.

MS: If Paladin can predict that it can not obey required timeframe allocated for installation of the security systems can it withdraw from the tender.

AT: Yes, we do sometimes withdraw because of this reason; however other things may have an influence as well. For example, equipment of DSC is not optimized for some special conditions like extreme humidity or extreme cold.

MS: Do you know when customers leave without ordering products when they are informed that it is not available for at least two or three month?

AT: Actually, this happens very often. We can't predict everything that customers would want in advance and if an item is rarely required we probably will not have the sufficient quantity in stock or we will not have it at all if recently someone bought all items. Then customers leave trying to find close substitution from other brands. Currently, we can't do anything about this, but we wish to find some solution to minimize such occurrences.

MS: Do errors in orders from a DSC to DCS Europe or DCS Factory in Canada occur often?

AT: This may happen. Most often it's our mistakes that lead to the problem. With model numbers differing only slightly, the order may contain a device which model is only 1 digit off the one we need.

MS: Does DSC produce custom built equipment?

AT: No, all the equipment is standard. In cases when government organization places an order, they require all the information on the control panels to be displayed in Russian language and all manuals to be in Russian as well. However, with controls panels the problem is solved by using different stickers and using Russian firmware, so if we get French panel, we can customise it for Russian market easily. All manuals are translated and are available by request of the customer.

MS: What is the process of payments for the delivered products from the DSC warehouse?

AT: Since Paladin is their official distributor we pay when the equipment is sold.

MS: Does it mean that equipment belongs to DSC until it is sold?

AT: Yes and no at the same time. The equipment we got is ours and they don't have direct control over it, but it is theirs in terms of the financial transactions.

MS: How do you (DSO Paladin) keep information on the status of the equipment in your warehouse?

AT: We have a database accessible from our main office, so at any point of time we know exactly what needs to be ordered and what items were not sold for a long time. As well we know which of the available items were already ordered or reserved. The software we use also shows the trends in the orders of particular device, so we may optimize our orders with respect to these trends. This system is new and we are very happy with it.

MS: Is it possible that some of the items that you have in the warehouse are in quantities that will not be required for a very long time?

AT: There are always some items that may be in the warehouse for more than a year or even two. They basically just waste space and it is very difficult to get rid of them. We attempt to use them as substitution for other equipment, but in most cases it is impossible. Then this equipment just stays there as long as it is not sold.

MS: Would you be interested in selling such equipment to other DSOs?

AT: We would certainly do, but there is not infrastructure for this currently. There is almost no communication between DSOs, but it will be interested in transferring some of items in our warehouse to other offices.

MS: Would you like to see changes in how the ordered items are delivered to Paladin?

AT: Yes, first if response time is decreased to the level when we can satisfy any needs of our customers, that's will be great, because, if they order a part of the system from DSC they will also order other parts from it. The reason is that it is much easier to work with equipment from one brand and don't mix one with the other. In some case such mix is at all impossible.

MS: Would you like to be able to order some parts not from DSC directly, if the equipment is not available in Europe, but from other direct sales offices as you are?

AT: Yes, this would work well, I think. But now it is not very feasible. We can't make small orders from one DSO or the other. We need to accumulate enough equipment for the order so that shipment cost will not be comparable to the cost of the equipment.

MS: In case of development of a new system, how much would you like to invest and when would you like to see profit?

AT: I believe that the maximum DCS would be able to invest is 400,000$ and would like to see profit in no more than 5 years.

MS: Would you consider selling the surplus equipment at lower price?

AT: Yes, this is a possibility. We could drop the price by 5% per month.

# Appendix F – Interview with DSO's Sales Manager

**The following is the transcript of the interview conducted by Moutovkin Serguei (MS) with Andrei Petrov, Sales Supervisor of Paladin Security Systems, DSO of DSC in Moscow, Russia (AP).**

MS: Andrei, please tell me your opinion on introducing a new system of ordering of the equipment from DSC, that I described to you earlier?

AP: I think that if all parties will adopt the system, it will make ordering more efficient. Paladin would use the system for sure. We are the largest distributor of DSC equipment in Eastern Europe and therefore would benefit from most of the features that you proposed. I really like the idea of being able to get rid of surplus from our warehouses by selling equipment to other DSOs.

MS: Do you think shipment of the equipment from one DSO to another will make equipment more expensive? Do you think it will be difficult to organize such transfers?

AP: I don't think it will be difficult to organize this; we have done similar transfers in the past so this can be done fairly easily. First, there are a number of transportation companies around that offer services of delivering large parcels from one city or country to another. They send items either using the trucks or railway. Both are very inexpensive, since security equipment is small in size and light, however expensive. In some cases DSC trucks that usually deliver equipment can pick up equipment from us and deliver to the other DSO, if they are on their way back to Hungary.

MS: Would it take you a lot of your effort to work with a program: submit database change log files, check requests and make orders through the program on a daily basis?

AP: In Paladin it will, probably, be my job to work with the program. I think that if program will be designed well and I can do most of the operations without waiting for the program do its job, it will not take a lot of my time. In any case it is similar to checking e-mail and responding. That really takes a lot of time.

MS: Do you think managers will hesitate using such program?

AP: I know some managers from other offices. All are used to working on a computer and if this will improve their business they will surely do. Even if some don't, which I doubt, the benefits of using the system are far beyond the time spent on using the program. As I can see it now, checking messages will take only a second. Submitting new orders is actually faster using the program, since now we have to type each order manually. Submitting log files should not take a lot of time as well.

MS: Would you like to see any features that we have missed during the preparation of the requirements for the system?

AP: I can't think of anything right now. But looking at how we work now, there is little communication between our office and the headquarters. Since we had no suggestions on improving the situation before, I do not think that we would need any additional features. Only one thing is really important for me, I don't want others to see what I have in my warehouse. And I also want transactions to be really secure.

MS: Our system didn't change anything in the current payment process, do we need this?

AP: No, the system currently in place is absolutely perfect. It works with our current system and our accountants already familiar with it and everyone is very happy.

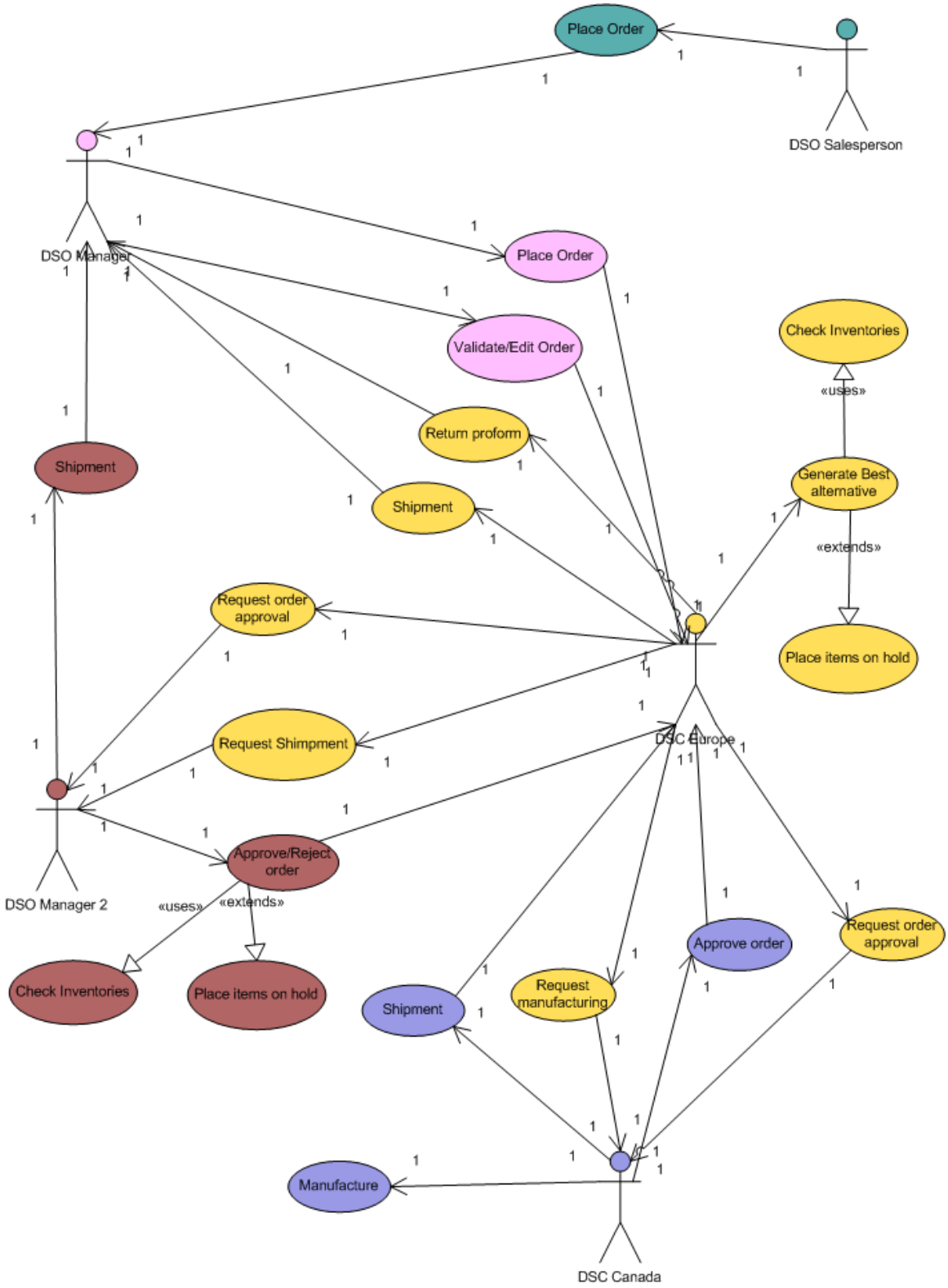
MS: Do you think it is important to have a possibility to extend the system as time goes by?

AP: Yes. Definitely yes, what we don't want or think of today, tomorrow will be very important. Look at how other programs evolve and add functionality which was not in previous versions, but after using it for a while you can't imagine how you worked before without it.

MS: If there are bugs in the program how would you like to inform developers about them?

AP: First, I hope there are no bugs. But did anyone see software without even small glitches? No. But if there are bugs, I can inform in anyway I'm supposed to – I can use e-mail or if bug reporting feature is integrated into the program, I can use it. For me everything works.

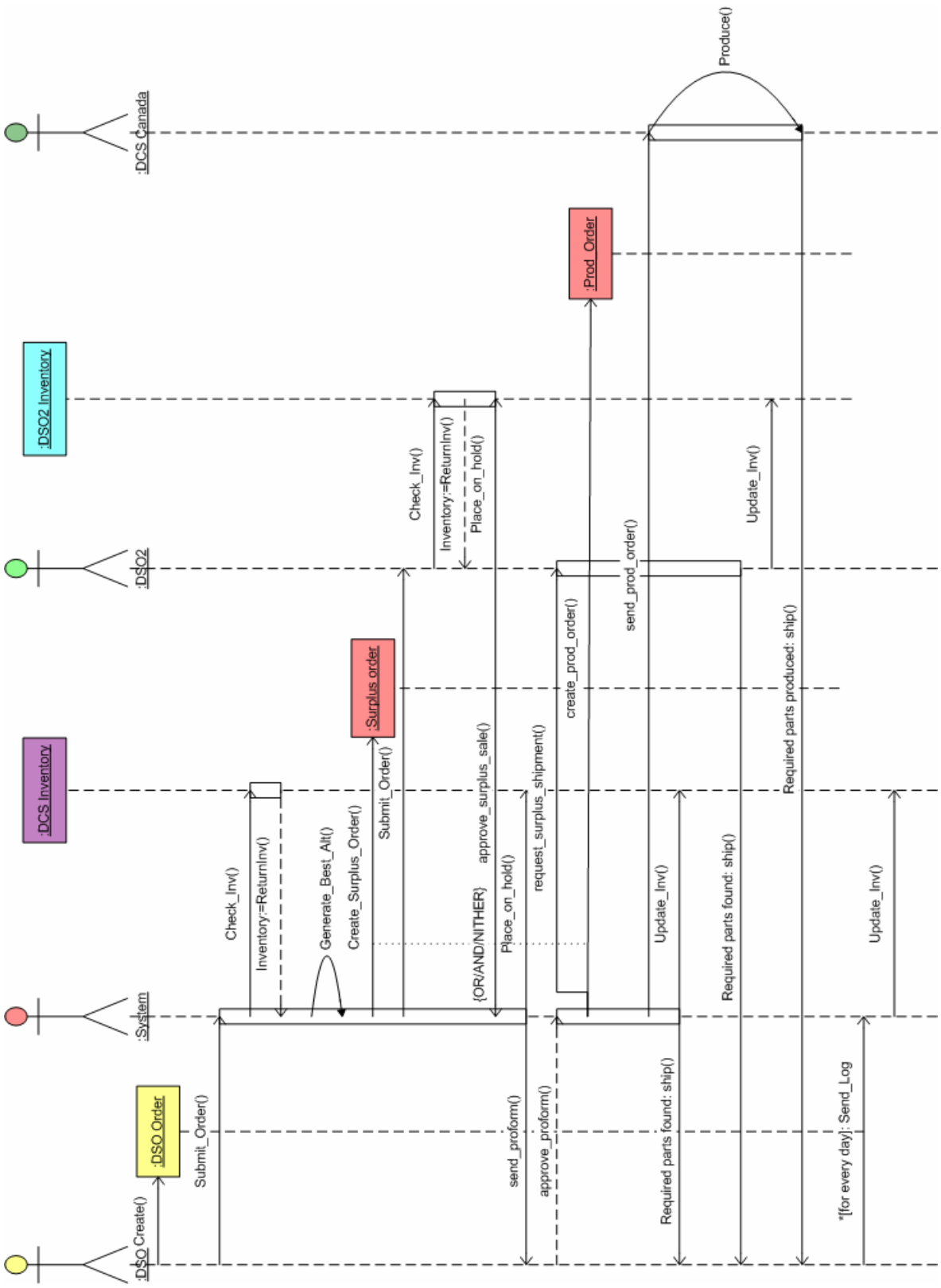
# Appendix G – Use cases diagram



# Appendix H – Sequence diagram

## *Sequence of operations*

1. A DSO manager creates and submits an order to DCS Europe system.
2. The system (DCS Europe) checks its inventory database which contains the inventories of all the storage facilities in the company including itself and generates a combination of manufacturing items/shipment of surplus or reserves in order to satisfy the order.
3. In case the generated combination included the shipment of DCS Europe's reserves, the necessary items are put on hold as explained in Use case diagram glossary on page 34 until the order is approved [explained in step 8]
4. In case the generated combination included shipment of surplus items of a nearby DSO (we will call it DSO2) to DSO that initiated the order (will be called DSO1), the system submits an order to DSO2 for the surplus parts to be shipped to DSO1. DSO2 manager reviews the order which among other things would include checking the inventory database of the DSO and also a visual inspection. Then the manager either rejects or approves the order. In case of approval, the items would be placed on hold as explained in Use case diagram glossary on page 34.
5. The system sends a proform to the manager of DSO1 in which the details of the best alternative is listed together with the approximate time of arrival of all parts.
6. DSO1 manager approves or rejects the order
7. In case of approval the system makes the necessary arrangements for all the parts to be sent to DSO1: If the alternative contained parts in DCS Europe storage facility, those are shipped. If it contained parts in any other DSO2, a request for shipment is sent to this DSO2. If the alternative contained manufacturing items, a request to DCS Canada factory is sent.
8. If DSO2 received a request to ship the items that were on hold it ships them to DSO1 directly, otherwise removes on hold status.
9. If DCS Canada receives a request to produce items, it produces the items and ships to DCS Europe, which in turn ships them to DSO1.


:DSO Create()
:DSO Order
:System
:DCS Inventory
:Surplus order
:DSO2
:DSO2 Inventory
:Prod_Order
:DCS Canada
Submit_Order()
Check_Inv()
Inventory:=ReturnInv()
Generate_Best_Alt()
Create_Surplus_Order()
Submit_Order()
{OR/AND/NITHER}
approve_surplus_sale()
Place_on_hold()
request_surplus_shipment()
send_proform()
approve_proform()
Check_Inv()
Inventory:=ReturnInv()
Place_on_hold()
create_prod_order()
send_prod_order()
Produce()
Update_Inv()
Required parts found: ship()
Required parts produced: ship()
Update_Inv()
Required parts found: ship()
"[for every day]: Send_Log
Update_Inv()

# Appendix I – Activities Glossary

**(Explanation of ambiguous activities in the system)**

**DSO manager | Create order** – Upon creating an order, the DSO manager has to consider the economical benefits (cost of manufacturing/shipping vs. price of the product) of the order and create it only if it would produce profit. That is the current course of operations and we shall not discuss this process in depth.

**DCS Europe | Generate best alternative** – When an order is submitted by a DSO, the system calculated the most economically efficient way of fulfilling the order. The factors that are at stake include the existence of surplus in nearby DSOs, the cost of shipment from given locations vs. the cost of shipment from different locations, the cost of manufacturing/shipping the product from DCS Canada factory, and the price of the products. The outcome of this calculation is a list of items and their current locations or indications that they will be manufactured as well as the detailed report on the price of shipment (or manufacturing + shipment) for each individual case and the approximated time of arrival.

**DSO manager, DCS Europe | Set inventory on hold** – When an order for certain products is in consideration, both DSO and DCS Europe storage facilities have to set the products on hold least they would be used for another order. When the order is approved by the initiating entity (DSO manager – the initiator of the order) the items are shipped. If rejected the on hold status is removed from the items.

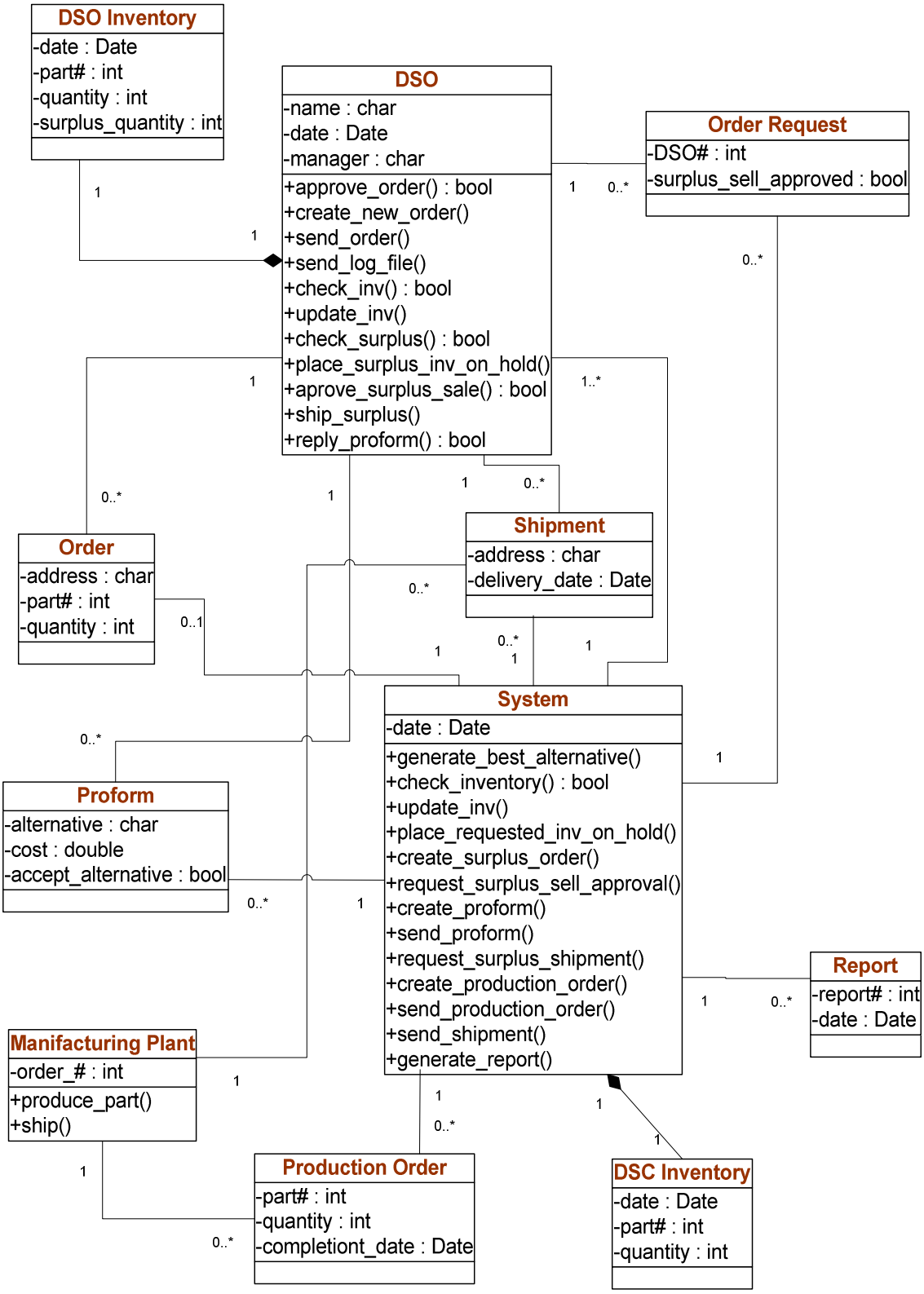
**DSO manager | Update inventory** – Transactions can result in a change of the DSO's inventory, therefore the private inventory database of each DSO has to be updated instantaneously.

**DSO manager | Uploading log file to the system** – At the end of every business day, each DSO uploads a log file containing all the transactions for that day to the system. That way the DCS database of inventories would be constantly updated as to the current Inventories of each particular DSO.

**DCS Europe | Update inventory** – Happens two cases: When the inventory of the storage facility of DCS Europe itself has changed (for example an order was fulfilled) or when a log file of daily transactions has been received from a DSO. In both cases the central inventory database has to be updated so that it would contain all the current inventories of all existing storage facilities in the company (Both of its own and of each and every DSO).

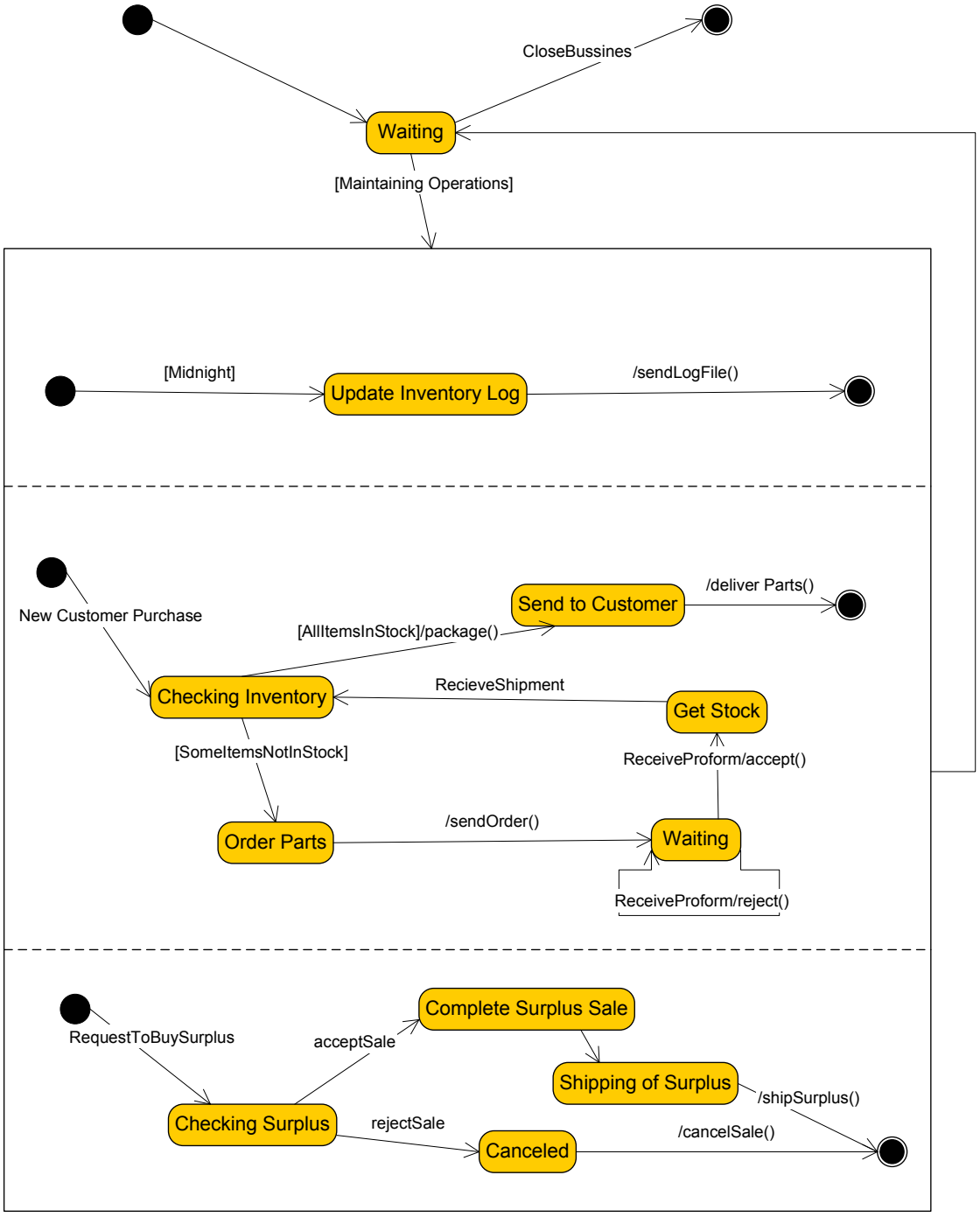
# Appendix J – Class Diagram

This is the class diagram that contains the classes our system will use. The two main classes are DSO and System. They model the two entities that do most of the actions. Class DSO represents DSO entities that distribute DSC products around Europe. There is one instance of this class for each actual DSO. Its job is to represent the DSOs in all aspects of the company's business model. The system is a class that represents DCS Europe and the software system that is proposed by us. It supports new feature like direct sales of surplus inventories from one DSO to another. This is the web-based system that is accessible by the DSOs to increase efficiency in delivery of orders. The other classes like inventory, order, proform and others support this and other functions of the system.


DSO Inventory
-date : Date
-part# : int
-quantity : int
-surplus_quantity : int
DSO
-name : char
-date : Date
-manager : char
+approve_order() : bool
+create_new_order()
+send_order()
+send_log_file()
+check_inv() : bool
+update_inv()
+check_surplus() : bool
+place_surplus_inv_on_hold()
+aprove_surplus_sale() : bool
+ship_surplus()
+reply_proform() : bool
Order Request
-DSO# : int
-surplus_sell_approved : bool
Order
-address : char
-part# : int
-quantity : int
Shipment
-address : char
-delivery_date : Date
System
-date : Date
+generate_best_alternative()
+check_inventory() : bool
+update_inv()
+place_requested_inv_on_hold()
+create_surplus_order()
+request_surplus_sell_approval()
+create_proform()
+send_proform()
+request_surplus_shipment()
+create_production_order()
+send_production_order()
+send_shipment()
+generate_report()
Proform
-alternative : char
-cost : double
-accept_alternative : bool
Report
-report# : int
-date : Date
Manifacturing Plant
-order_# : int
+produce_part()
+ship()
Production Order
-part# : int
-quantity : int
-completiont_date : Date
DSC Inventory
-date : Date
-part# : int
-quantity : int

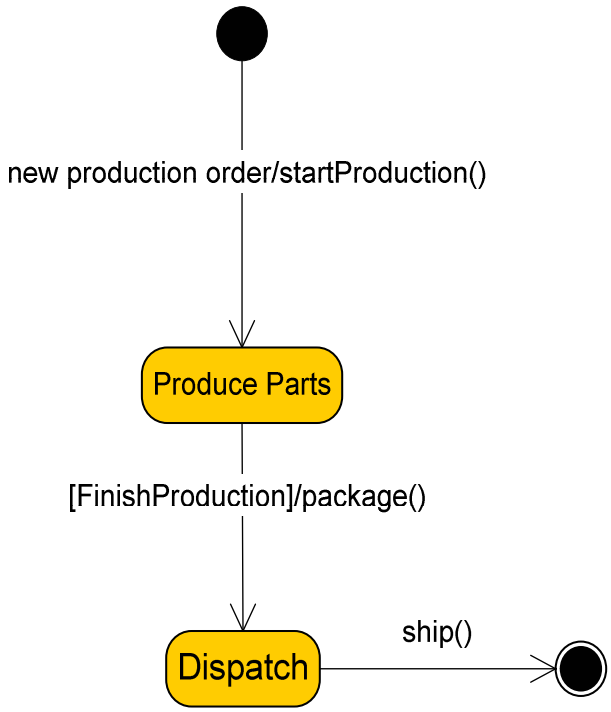
# Appendix K – DSO State Diagram

This is the representation of the DSO class. These are the individual entities that sell DSC products in Europe. The way this works is the following. Every night DSOs update their inventories and surplus stocks and send this information to the system in the main headquarters. When DSO has a contract with a customer, they check if they have enough of their stock to do the job. If that is the case then ship the order to the customer and that's that. However, if they don't have enough to fulfill the order, they send an order to DSC Europe though the proposed web based system, which will fulfill their order and ship them back the parts. They receive a Proform from the headquarters about their order. If they agree to it, they are shipped the parts and can now fulfill their customers order. The following diagram is an AND superstate of the DSO. Any of the 3 states inside, could be happening in the same time frame.


CloseBussines
Waiting
[Maintaining Operations]
[Midnight]
Update Inventory Log
/sendLogFile()
New Customer Purchase
Send to Customer
/deliver Parts()
[AllItemsInStock]/package()
Checking Inventory
RecieveShipment
Get Stock
[SomeItemsNotInStock]
ReceiveProform/accept()
Order Parts
/sendOrder()
Waiting
ReceiveProform/reject()
RequestToBuySurplus
Complete Surplus Sale
acceptSale
Shipping of Surplus
/shipSurplus()
Checking Surplus
rejectSale
Canceled
/cancelSale()

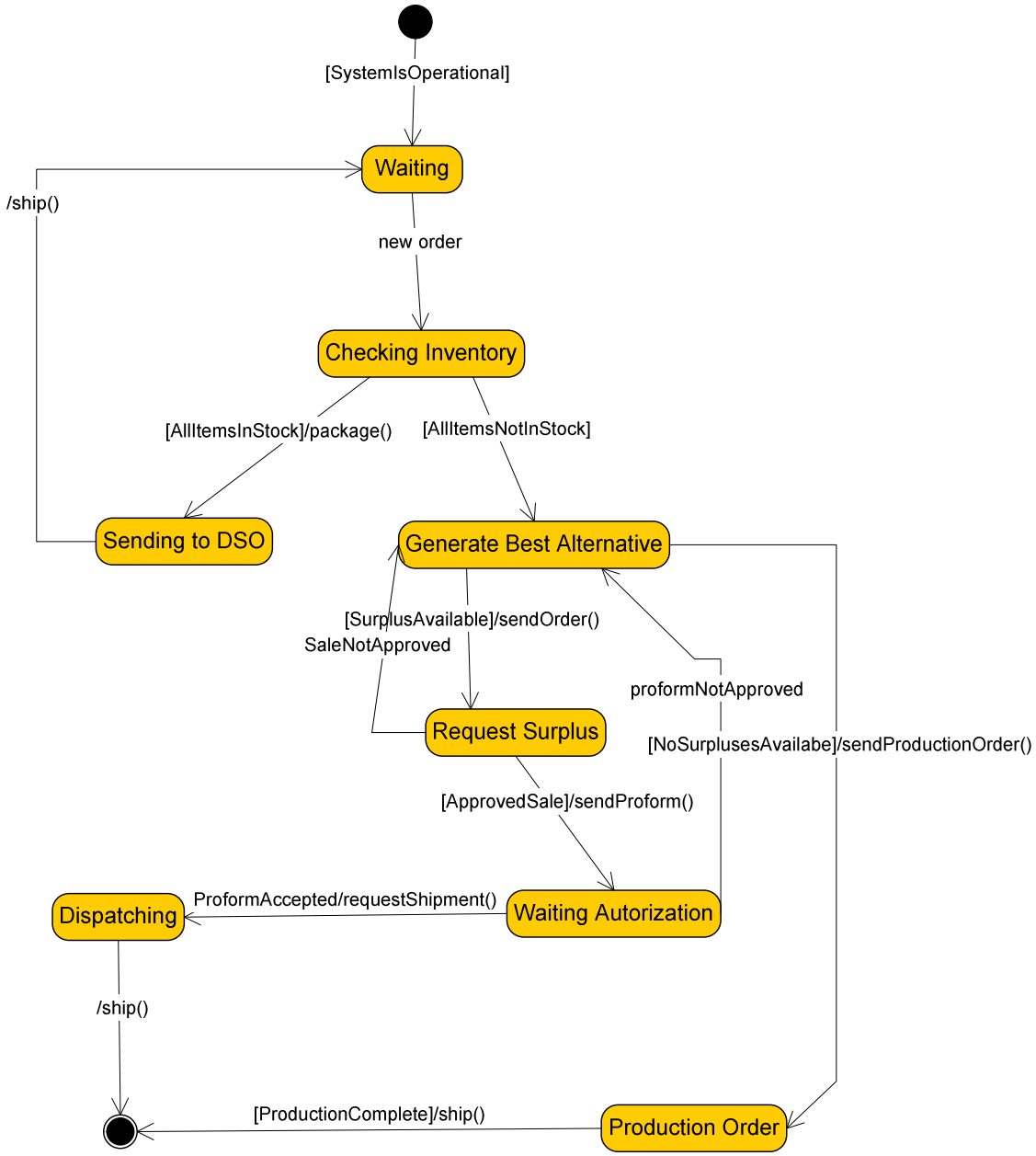
# Appendix L – Production Plant State Diagram

This class represents the Production Plant. When DSC Europe can't fulfill an order for one of its DSO offices or when its inventory stock is low, they order more parts from the Production Plant in Canada. They send a production order of what they need and when they need it to the plant. Once the production of the parts is finished, they are shipped to DSC Europe.



# Appendix M – System State Diagram

The system DSC Europe receives an order form one of the DSOs. Now the system, in order to fulfill this order checks the inventory of the main warehouse to see if the order can be fulfilled. If so, it sends the shipment of requested parts to the DSO. If they don't have the parts in their stock then they look at trying to reroute the order to another DSO that has the needed parts in their surplus stock. Best Alternative checks the surpluses of all DSOs and sends requests to sell that surplus to the ordering DSO. If that sale cannot be completed or the ordering DSO won't find this option economically viable then another DSO is tried. If there are no surpluses available or no sale can be agreed upon then a production order is made to DSC Canada for parts to be made. Once they're made, they are shipped back and can now be supplied to the DSO.


[SystemIsOperational]
Waiting
/ship()
new order
Checking Inventory
[AllItemsInStock]/package()
[AllItemsNotInStock]
Sending to DSO
Generate Best Alternative
[SurplusAvailable]/sendOrder()
SaleNotApproved
proformNotApproved
Request Surplus
[NoSurplusesAvailabe]/sendProductionOrder()
[ApprovedSale]/sendProform()
Dispatching
ProformAccepted/requestShipment()
Waiting Autorization
/ship()
[ProductionComplete]/ship()
Production Order

# Appendix N – System Features Questionnaire

## Poland DSC Office Questionnaire

**1. How would you rate the efficiency of the current system?**

☐Excellent ☐Good ☒Adequate ☐Poor

**2. How would you rate the security of the current system?**

☐Excellent ☒Good ☐Adequate ☐Poor

**3. Do you think that the current system should have more features?**

☒ Yes ☐ No

**4. Is it important for a manager to know how long his/hers order will take?**

☒Yes ☐No

**5. Would you to see a feature that shows right away how long your order completion would take?**

☒Yes ☐No

**6. Would you like to see a list of immediately available parts that you could order?**

☒Yes ☐No

**7. Do you like your current system interface?**

☐Yes ☒No

**8. How would you rate it in terms of ease of use?**

☐Excellent ☐Good ☒Adequate ☐Poor

# Ukraine DSC Office Questionnaire

**1. How would you rate the efficiency of the current system?**

☐Excellent ☐Good ☒Adequate ☐Poor

**2. How would you rate the security of the current system?**

☐Excellent ☐Good ☐Adequate ☒Poor

**3. Do you think that the current system should have more features?**

☒ Yes ☐ No

**4. Is it important for a manager to know how long his/hers order completion will take?**

☒Yes ☐No

**5. Would you to see a feature that shows right away how long your order would take?**

☒Yes ☐No

**6. Would you like to see a list of immediately available parts that you could order?**

☒Yes ☐No

**7. Do you like your current system interface?**

☐Yes ☒No

**8. How would you rate it in terms of ease of use?**

☐Excellent ☐Good ☐Adequate ☒Poor

# Greece DSC Office Questionnaire

**1. How would you rate the efficiency of the current system?**

☐Excellent ☒Good ☐Adequate ☐Poor

**2. How would you rate the security of the current system?**

☐Excellent ☒Good ☐Adequate ☐Poor

**3. Do you think that the current system should have more features?**

☐ Yes ☒ No

**4. Is it important for a manager to know how long his/hers order completion will take?**

☒Yes ☐No

**5. Would you to see a feature that shows right away how long your order would take?**

☒Yes ☐No

**6. Would you like to see a list of immediately available parts that you could order?**

☒Yes ☐No

**7. Do you like your current system interface?**

☒Yes ☐No

**8. How would you rate it in terms of ease of use?**

☐Excellent ☒Good ☐Adequate ☐Poor

# Germany DSC Office Questionnaire

**1. How would you rate the efficiency of the current system?**

☐Excellent ☐Good ☐Adequate ☒Poor

**2. How would you rate the security of the current system?**

☐Excellent ☐Good ☐Adequate ☒Poor

**3. Do you think that the current system should have more features?**

☒ Yes ☐ No

**4. Is it important for a manager to know how long his/hers order completion will take?**

☒Yes ☐No

**5. Would you to see a feature that shows right away how long your order would take?**

☒Yes ☐No

**6. Would you like to see a list of immediately available parts that you could order?**

☒Yes ☐No

**7. Do you like your current system interface?**

☒Yes ☐No

**8. How would you rate it in terms of ease of use?**

☐Excellent ☐Good ☐Adequate ☒Poor

# Russia DSC Office Questionnaire

**1. How would you rate the efficiency of the current system?**

☐Excellent ☐Good ☐Adequate ☒Poor

**2. How would you rate the security of the current system?**

☐Excellent ☒Good ☐Adequate ☒Poor

**3. Do you think that the current system should have more features?**

☐ Yes ☒ No

**4. Is it important for a manager to know how long his/hers order completion will take?**

☒Yes ☐No

**5. Would you to see a feature that shows right away how long your order would take?**

☒Yes ☐No

**6. Would you like to see a list of immediately available parts that you could order?**

☒Yes ☐No

**7. Do you like your current system interface?**

☒Yes ☐No

**8. How would you rate it in terms of ease of use?**

☐Excellent ☐Good ☐Adequate ☒Poor